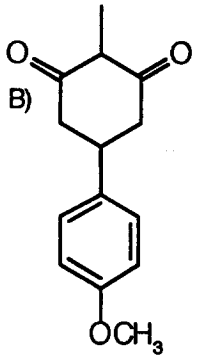
Name KEY
Chem 227 / Dr. Rusay / Exam 2

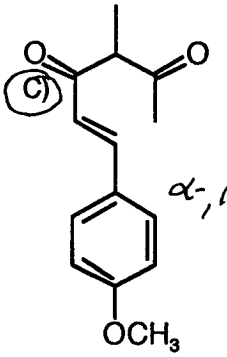
1) [3pts] Which of the following is as an electrophilic reagent which can react with an enolate ion?

A) NH_3 (B) NH_4+ C) CH_3OH D) $AlCl_4^-$ E) $NaBH_4$

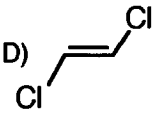
2) [3pts] Which of the following molecules will have the highest dipole moment?

A) CCl_4



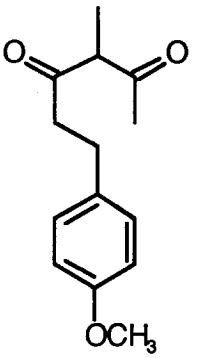


D)

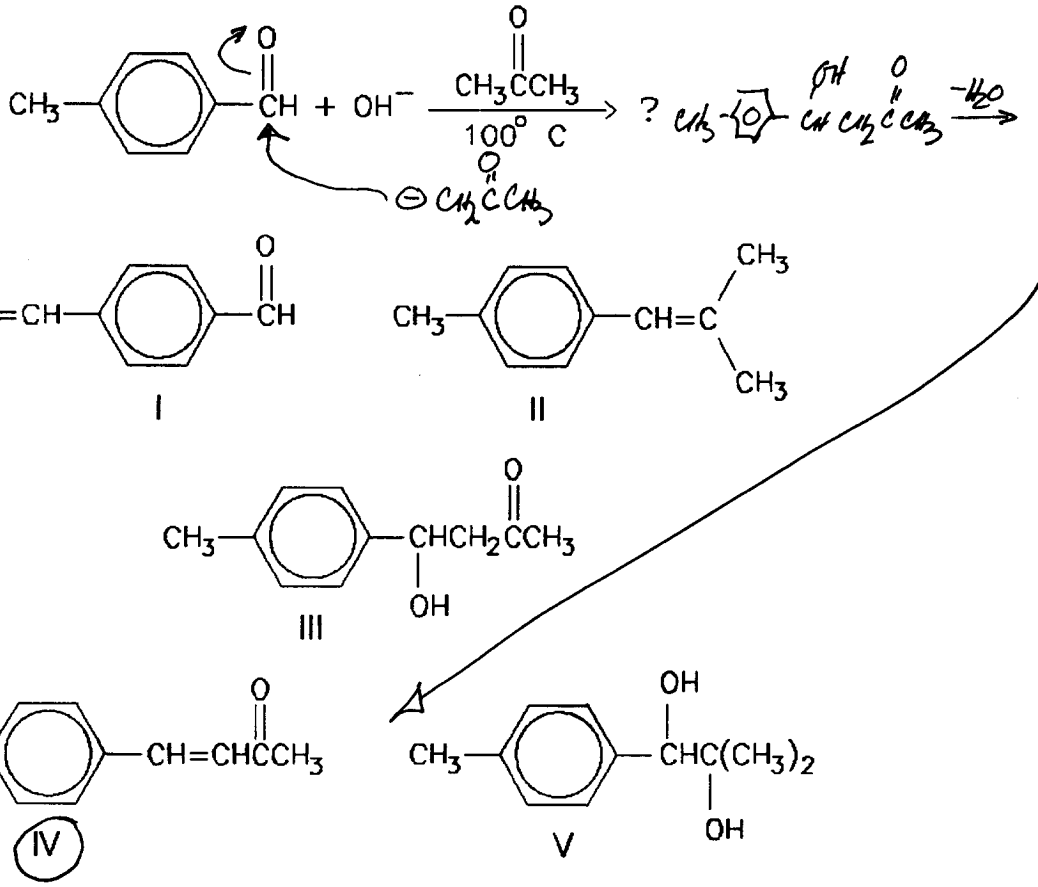


α-, β-unsat.

E)

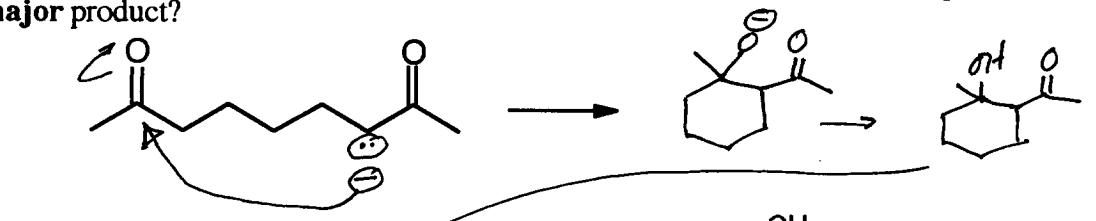


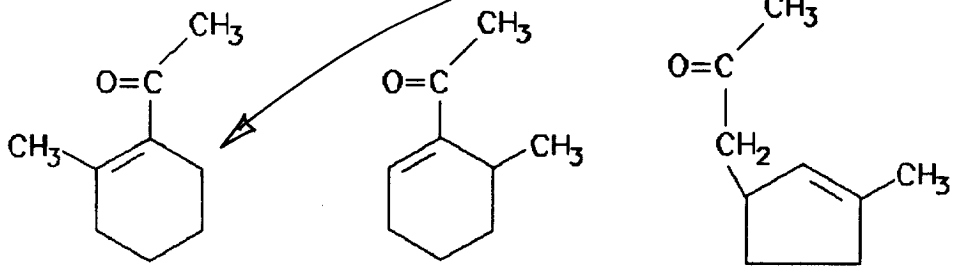
3) [3pts] What is the major product of the following reaction?



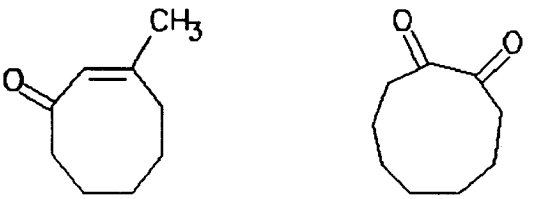
9

4) [3pts] When the following diketone cyclizes in basic solution, which compound is the **major** product?



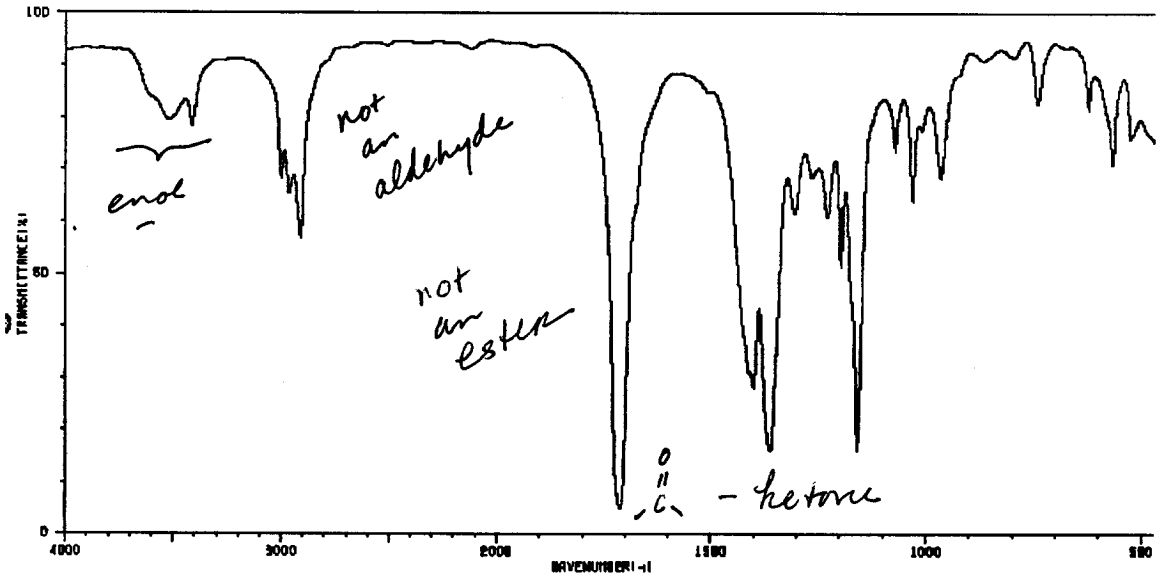


I II III



IV V

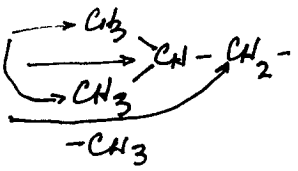
5) [8pts] A compound was analyzed and found to have a molecular formula of $C_6H_{12}O$ with a very weak UV absorbtion at 310 nm. The IR, NMR and principal MS fragment data folllow.



Continued on next page.

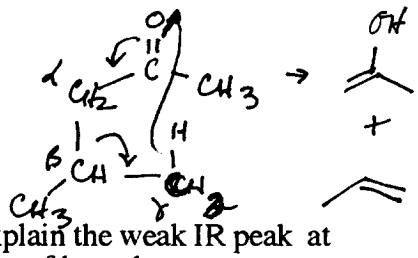
^{1}H: chemical shift; splitting; integration

1.05 ppm (d), (6H)
1.66 ppm (m), (1H)
2.10 ppm (s), (3H)
2.30 ppm (d), (2H)

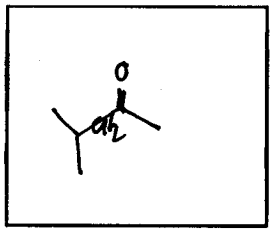


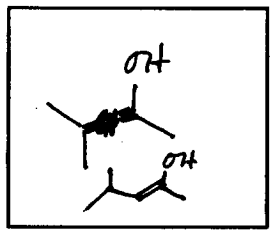
MS: m/e

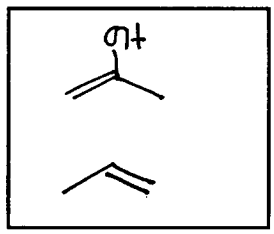
42
43
57
58



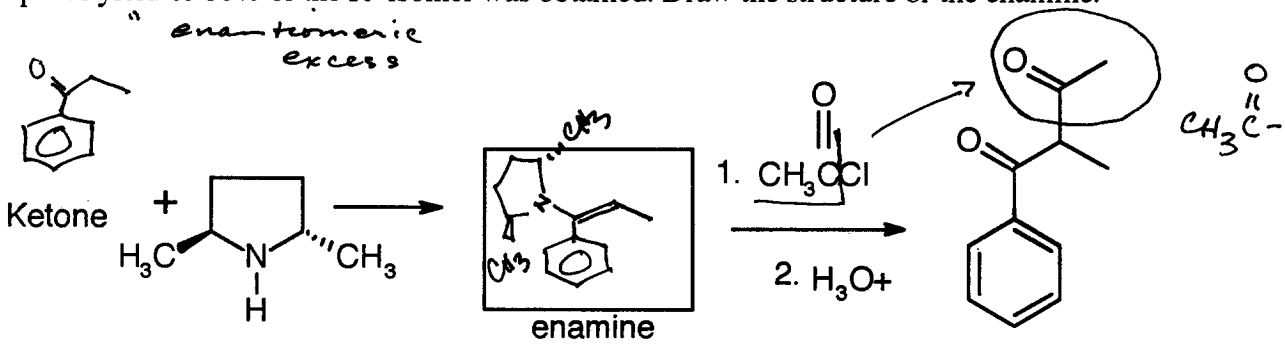
a) Provide a structure for the compound and b) a structure to explain the weak IR peak at 3500 cm^{-1} and c) MS fragments at 42 and 58 with an illustration of how these two rearrangement fragments formed.

a) 

b) 

c) 

6) [12pts] The following dione was synthesized by the Stork method from an enamine of a ketone and (+) 2,5-dimethyl pyrrolidine followed by treatment with acetyl chloride. An optical yield of 80% of the R- isomer was obtained. Draw the structure of the enamine.

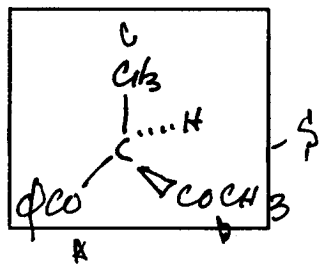


a) Name the ketone in the reaction that produced the enamine.

propiophenone

b) What % of the S- isomer is present in the product? 10

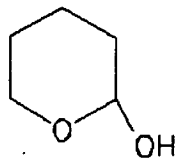
c) Draw the R- isomer of the product.



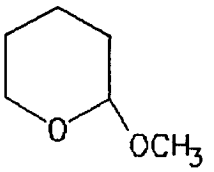
d) What is the best description for this type of reaction ?

A) Alkylation (B) Acylation C) Ring Annelation D) 1,4 Addition

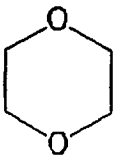
7) [3pts] Circle the structure that is an acetal or ketal.



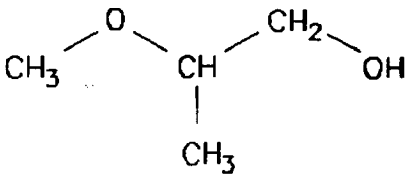
I



(II)

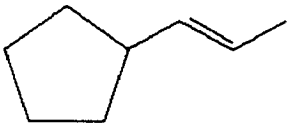


III



IV

8) [6pts] a) Circle the Wittig reagent that could be used to synthesize the following alkene:

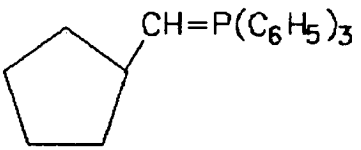


?

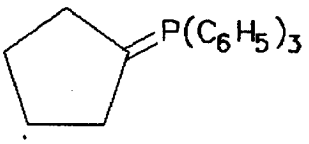
$CH_3CH{=}P(C_6H_5)_3$

(I)

OR



(II)

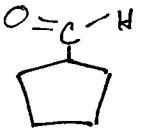


III

$CH_3CH_2CH{=}P(C_6H_5)_3$

IV

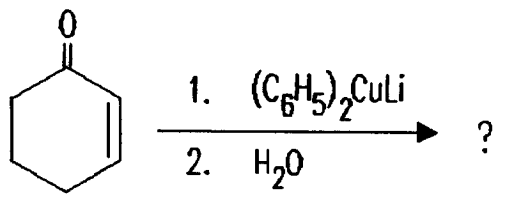
b) Write the structure for the carbonyl compound that would be reacted with the Wittig reagent you chose above to produce the alkene:

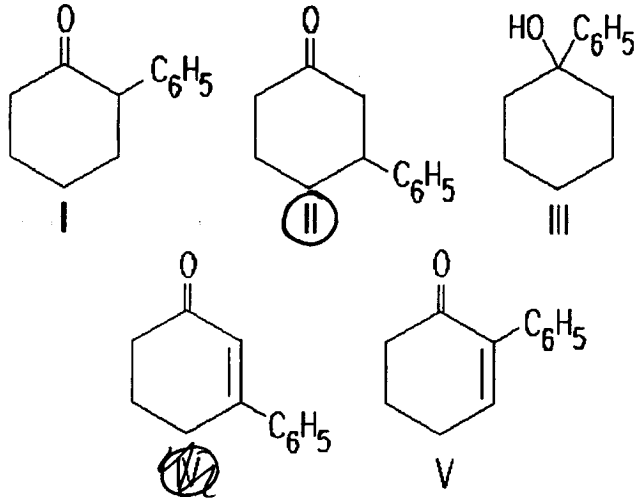
w/ I) 

II)

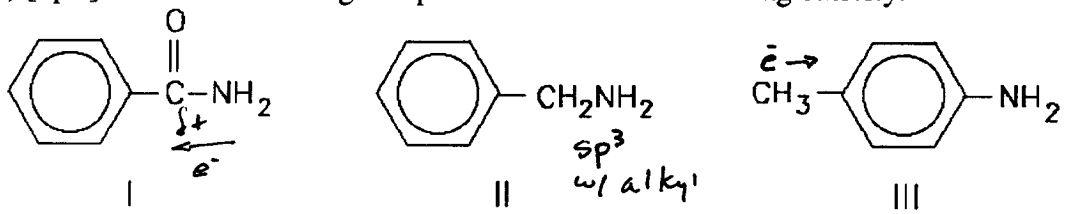
9) [3pts] What is the major product of the following addition reaction?

1, 4 add'n





10) [5pts] Rank the following compounds in order of decreasing basicity.



sp³ w/ alkyl

sp³ w aryl

II > III > V > IV > I

11) [5pts] Rank the folllowing compounds in order of decreasing boiling point.

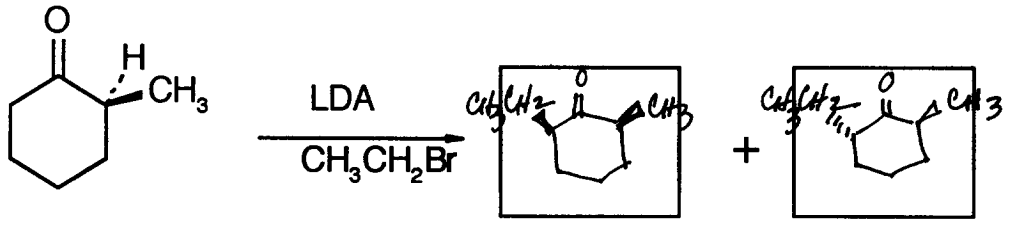
A) $CH_3CH_2CH_2NH_2$ 48°C B) $(CH_3)_3N$ (b.p.= 3°C) C) $CH_3CH_2NHCH_3$ 37°C

D) $CH_3CH_2CH_2OH$ 97°C E) $CH_3CH_2OCH_3$ 10°C

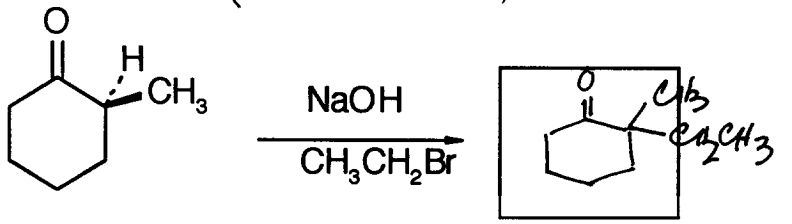
D > A > C > E > B

accept B > E

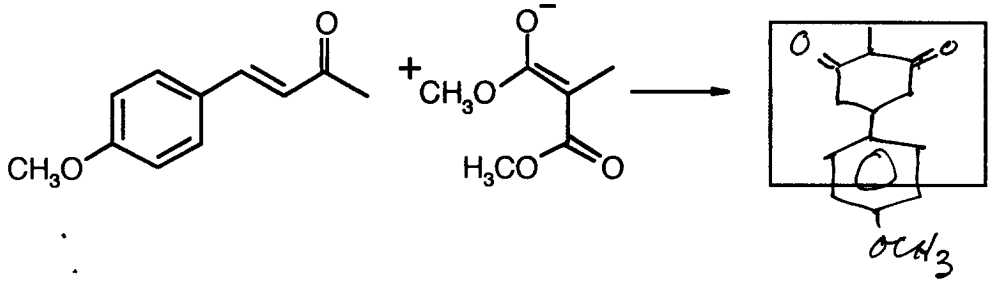
12) [4pts] Two compounds with the same molecular ion in their Mass Spectra but different boiling points were obtained form the following reaction. Draw their structures indicating their respective stereochemistry.



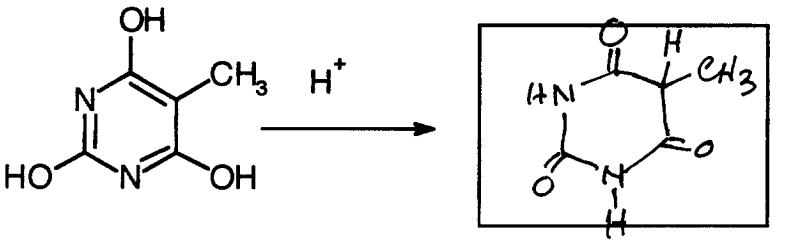
13) [3pts] A single product was obtained from the following reaction. Draw its structure.
(enantiomeric)



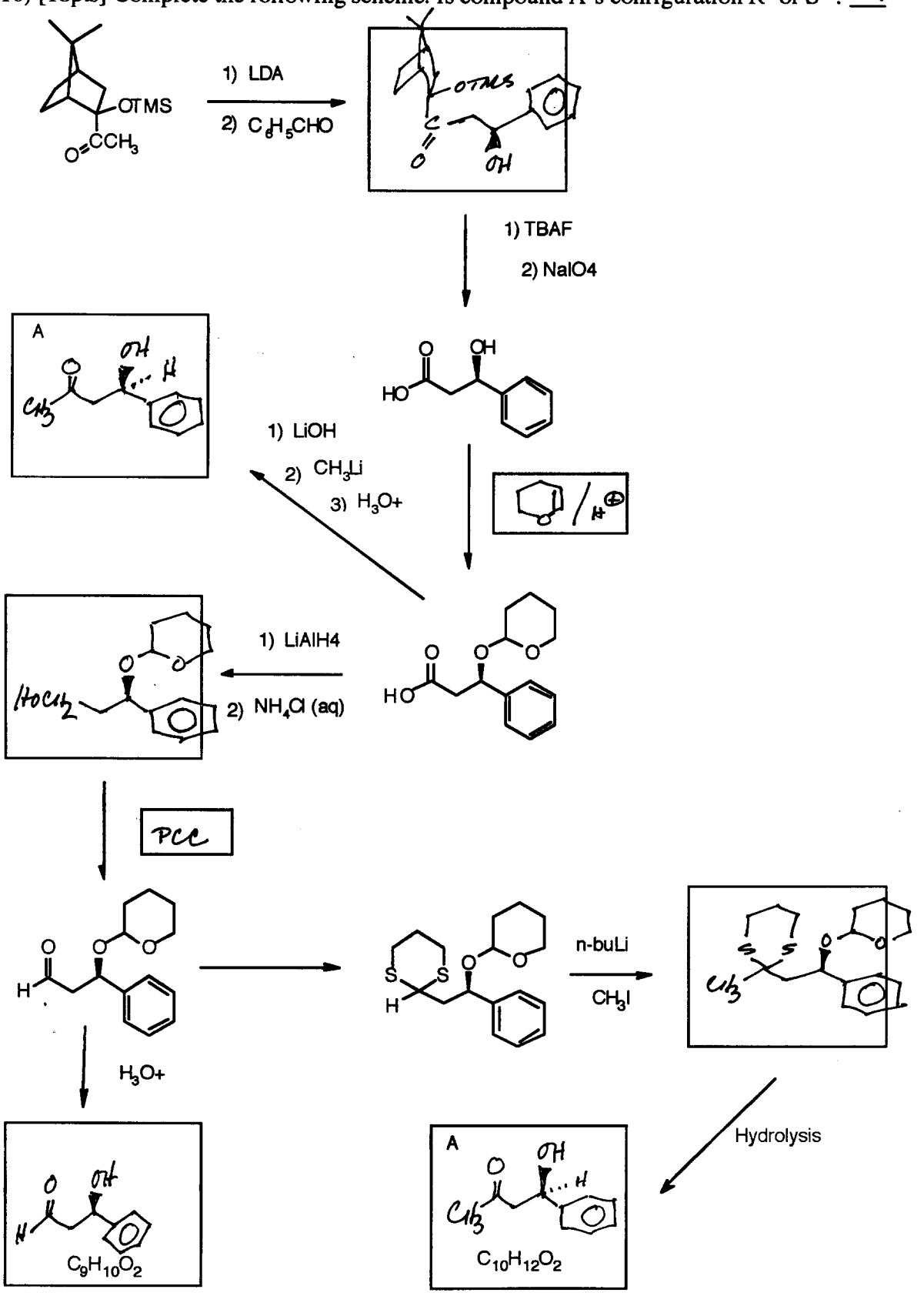
14) [3pts] Provide the structure of the product which was produced on refluxing the intermediate formed from the reaction of the following α, β- unsaturated ketone with the enolate of methyl-dimethylmalonate and aqueous sodium hydroxide followed by boiling the reaction mixture with a stoichiometric excess of hydrochloric acid.



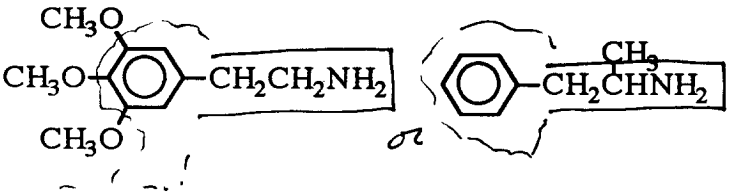
15) [3pts] Draw the tautomer for the following barbiturate:



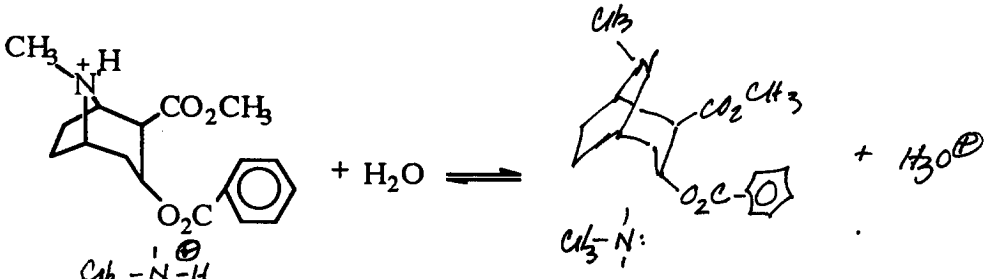
16) [18pts] Complete the following scheme. Is compound A's configuration R- or S- ? R -



17) [3pts] Mescaline and amphetamines have structural similarities to neurotransmitters, serotonin and adrenalin. Circle the common structural feature that is likely accountable for their neurological activity.

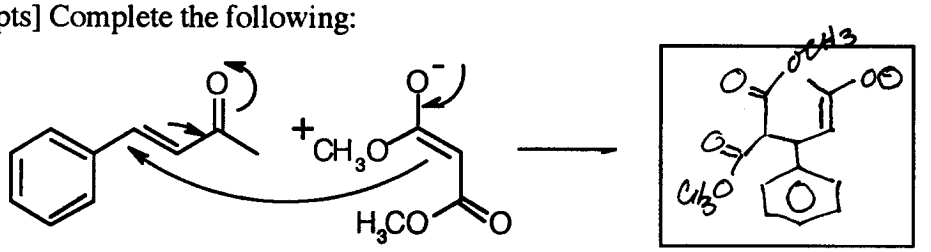


18) [6pts] Complete the reaction and write the equilibrium expression for Ka.

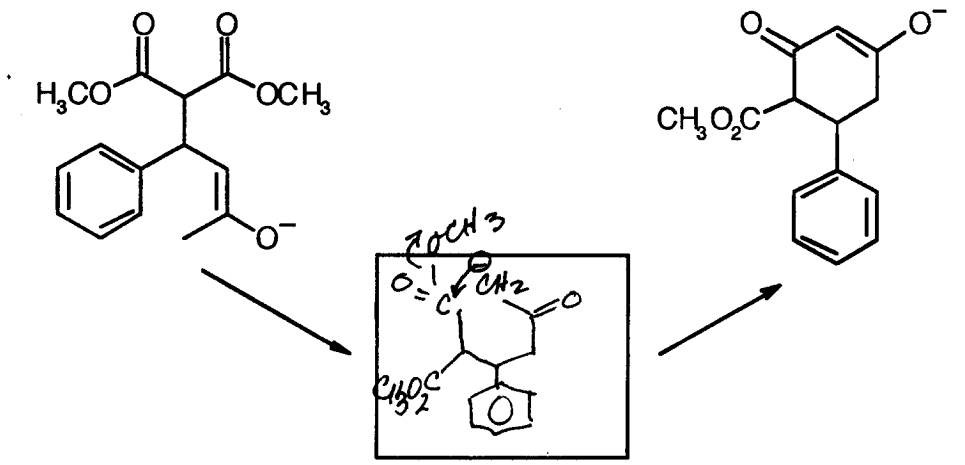


$$Ka = \frac{[CH_3-\ddot{N}:][H_3O^+]}{[CH_3-\overset{\oplus}{N}-H]}$$

19) [5pts] Complete the following:



Draw the appropriate carbanion and show electron movement with arrows from it to the enolate.



actually (1) add (2) eliminate
2 STEPS